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**EXECUTIVE SUMMARY**

This Phase I Accreditation Support Package (ASP I) is designed to provide a potential user with a characterization of the current state of the subject model with respect to criteria related to its general acceptability for use. The information collected in this phase should characterize the model well enough to provide an initial determination of its suitability for a particular application. It should also provide confidence that the model is well enough managed and supported to yield consistent results across its spectrum of users and applications. The information provided to characterize the subject model consists of the following elements:

- a. A description of the configuration management baseline for the model, including version history, current version status, model development policy (including beta site provisions), documentation availability, and a summary of configuration management policies, procedures, guidelines and support functions in place for the model;
- b. A summary of implicit and explicit assumptions and limitations inherent in the model because of its design and/or coding assumptions or structure, as well as any implied constraints to the use of the model that are a consequence of these assumptions or structures. A listing of known errors or anomalies found as a result of prior V&V efforts is also included;
- c. A review of the model's development, verification and validation (V&V) and usage histories, as well as a summary of prior accreditations;
- d. A review of the status of model documentation and its conformity to accepted software documentation standards, as well as a review of documentation with respect to verification requirements; and
- e. A summary of overall software quality as characterized by conformance to accepted design and coding practices.

ASP I provides the details of these information elements in a single document. The degree to which each information element is complete and current provides a general indication of whether the model is suitable for further consideration for use in a particular application.

**Configuration Management Baseline:** The EADSIM software is managed by the U.S. Army Space and Strategic Defense Command (SSDC), which is located at the Redstone Arsenal in Huntsville, AL. The model manager is Mr. James T. Watkins, II, (205) 955-1681, DSN 645-1681 (CSSD-BC-T). Maintenance, enhancement, and distribution functions are performed by Teledyne Brown Engineering (TBE) and the point of contact (POC) for the software is Ms. Penny Ackerman, (205) 726-2415. Source code is only distributed with the express written permission of the model manager and proper justification is required to obtain it. EADSIM can be executed on SUN or Silicon Graphics workstations and appropriate executable versions are supplied to each user upon receipt of a written application and approval by SSDC. Configuration control is strict, formal, and release of model versions is accomplished via an effective CM process that is coordinated by SSDC and executed by TBE. Version 5.0 of the software was released in January of 1996, but the information presented here was compiled while version 4.01 was in the process of being updated through several interim releases identified by letters (4.01a

through 4.02h) that were produced for the Ballistic Missile Defense Office (BMDO) to support the Theater Missile Defense (TMD) COEA effort during the last half of 1995. The CM process and procedures were not altered and remain applicable as of the date of this publication. The process for addressing user reported errors and software change requests (SCRs) is robust and has been in place for more than 5 years. A source code control system (SCCS) is used internally by TBE to maintain the software and effect changes without impacting existing release versions and to track changes made to the source code by programmers. A variety of Computer Automated Software Engineering (CASE) tools and databases are used to plan, design, and track software changes to the source code. A toll free user hotline number is available for support and reporting of problems and a 5-day training course is provided by TBE at regular intervals throughout the year. Because the Configuration Control Board (CCB) meets semi-annually to review and decide upon SCR actions, user requests for new features or corrections of minor problems may require 6 months to one year to accomplish.

**Assumptions, Limitations, and Errors:** A tabular listing of assumptions and limitations for versions 4.01 and 5.00 is provided in Section 3 and addresses both global and functional element (FE) levels. Some of those applicable to the former version were altered by changes that resulted in the latter version. Errors listed are for version 4.01 and were corrected for version 5.0, for which no errors have yet been reported. Implications for model use are also provided for each assumption, limitation, and error listed. Errors for version 4.01 applied mostly to Ruleset problems for specific player types and two were reported that affected Track Processing functions. None were significant enough to warrant discontinued use of the model for analysis purposes unless efforts were focused on the specific player types affected.

**V&V Status and Usage History:** Even though EADSIM users reported performance of V&V activities, no documentation of results is currently available. The Air Force Operational Test and Evaluation Center (AFOTEC) conducted a V&V Survey in 1994 that also reported this conclusion. An Analytical Tool Box (ATB) Confidence Assessment was performed on Version 3.0 in 1993 that compared model capabilities and management processes with established guidelines, which reported favorable results in most areas. The TMD COEA Panel On-site Assessment represents the most recent effort and resulted in an informal accreditation of the model for use in the TMD COEA. Other than current SMART Project efforts, which are limited to top level model status, documentation, and software quality assessments, functional decomposition, top level conceptual model specification, and partial software design and sensitivity analysis investigations, no other V&V activities are being conducted. SSDC has designated Systems Development Corporation (SDC) as the independent V&V agent for EADSIM, but resources applied to assessment activities has been limited and confined primarily to source code analysis, testing, and SCR tracking.

EADSIM has been used in support of mission and/or theater level analysis studies and to evaluate mission planning alternatives since its initial release in 1989. It was also used by the Air Force Studies and Analysis Agency (AFSAA) to analyze defense suppression and refueling missions during Operation Desert Storm. There are currently over 300 registered user sites using EADSIM, and a listing of 143 users who requested and received version 5.0 is provided in Appendix C.

**Documentation Assessment:** EADSIM documentation consists of a set of five documents packaged into six separate manuals identified as: the Executive Summary, the Software

User's Manual (SUM), the User's Reference Manual (URM), Parts I and II of the Methodology Manual, and the Manual Set Addendum (MSA). An assessment of the version 4.0 documents was performed by an independent verification agent (IVA), Entek, Inc., (who also performed the V&V status survey for AFOTEC in 1994), and their results are included in Section 5 of this report. Although none of the manuals complied fully with the SMART Project recommended standards required to support verification, requirements for SUM and Software Analyst's Manual (SAM) were mostly satisfied by existing manuals and some of the information required for the Software Programmer's Manual (SPM) was found in portions of the Methodology Manuals. Recommendations for modifications to existing manuals to comply with recommended standards are also provided in Section 5, and overall assessment of the documentation was described as generally complete with the exception of missing SPM related material.

**Software Quality Assessment:** Software Quality Assessment: Overall, the EADSIM source code was assessed as excellent, scoring an 8.34 out of a possible 10 on five Measures of Effectiveness (MOEs). The five MOEs were: (1) programming conventions (weighted 10%), (2) source code quality (weighted 30%), (3) defect density (weighted 40%), (4) computational efficiency (weighted 10%), and (5) supportability (weighted 10%). The source code quality MOE was evaluated by two related methods: an assessment of source code complexity and an assessment of the clarity and sufficiency of source code comments. Source code complexity was relatively high but in the acceptable range as evaluated using the C-DOC C static analyzer, and a sample analysis report is included in Section 6.2. Defect density is defined as the number of defects or "bugs" in a software release divided by the number of new and modified source lines of code. The defect density for EADSIM was found to be comparable with good to excellent quality commercial software. Additional details of the software assessment can be found in Section 6.